Asset optimization in wind power – strategic spare transformer management

Location: Multiple wind power complexes, Brazil
Project date: June 2024

Introduction: Driving smarter decisions in renewable energy

The Woodhouse Partnership specializes in consulting, training and decision support solutions for organizations managing physical assets. This case study showcases how our asset optimization consultancy expertise, combined with our innovative approach to asset management decision making, enabled a leading renewable energy operator in Brazil to make informed, cost-effective decisions for its wind power complexes.

The project involved five large wind farms, with multiple high-capacity step-up transformers (120–240 MVA). Failures in these critical assets can result in **9–12 months of downtime**, causing significant revenue loss and operational disruption. Using a proven combination of the SALVO decision-making process, alongside our Decision Support Tools (DST) software, we helped the client evaluate options objectively, quantify risks and prioritize investments – **delivering millions in cost savings**.

Situation: A complex challenge across multiple sites

Managing critical infrastructure across dispersed wind farms presents unique challenges. In this case, the operator faced:

- management of **five major wind power complexes**
- only **one spare transformer available** (at one complex), leaving other sites exposed
- logistical difficulties for moving equipment between sites, compounded by long lead times for new transformers

Failures could lead to prolonged outages, high financial impact and reputational risk. The client needed a structured approach to assess whether additional investments – such as civil works, rails or extra spares – would deliver value.

A key aspect was evaluating the spares inventory and implementing spare parts optimization strategies to ensure operational resilience.

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Task: Applying asset investment optimization principles

The objective was to apply asset investment optimization principles to determine:

- the optimal number and location of spare transformers
- whether to invest in civil works, additional rail infrastructure between sites and/or additional back-up equipment
- how to minimize downtime and financial exposure while maintaining compliance and safety

Our DST project/change evaluator module was used to:

- model costs, risks and benefits for each option
- provide consistent business case evaluation and justification
- enable objective comparison and prioritization of expenditures considering the return on each investment made.

This included a detailed review of the spares inventory and spare parts optimization to balance cost and risk.

Action: Data and knowledge-driven analysis for confident decisions

Our team conducted a comprehensive analysis using DST's embedded capabilities and using the best reference data available (through market benchmarking and from the client's own database). Where there were gaps in data, we used systematic methods to capture expert knowledge, judgment and estimates to support the analysis, which included:

- **Sensitivity testing:** energy prices, lead times and failure probabilities
- **Evaluated scenarios:**
  - Relocating the spare
  - Installing rail infrastructure for faster movement
  - Civil works for adapting bases for 240 MVA units
  - Acquiring an additional back-up transformer
- Applied **discounted cashflow modeling** and risk quantification to calculate return on investment (ROI) and exposure
- Considered **intangible factors** such as compliance, reputation and operational resilience

This structured approach aligns with best practice in decision science and delivered clarity and confidence for stakeholders.

The project's focus on spare parts optimization and effective spares inventory management was central to achieving these outcomes.

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Result: Millions saved through strategic choices

The analysis demonstrated the power of asset optimization.

- **Optimal strategy:** Keep the single spare at its existing location.
  - Avoided unnecessary investments:
  - Installing rail infrastructure (negative ROI)
  - Civil works for adapting bases (better to implement if and when necessary)
  - Acquiring additional back-up transformer (cost > benefit)
- Implemented a robust contingency plan for rapid response

Savings: Approximately $3 million USD in avoided costs

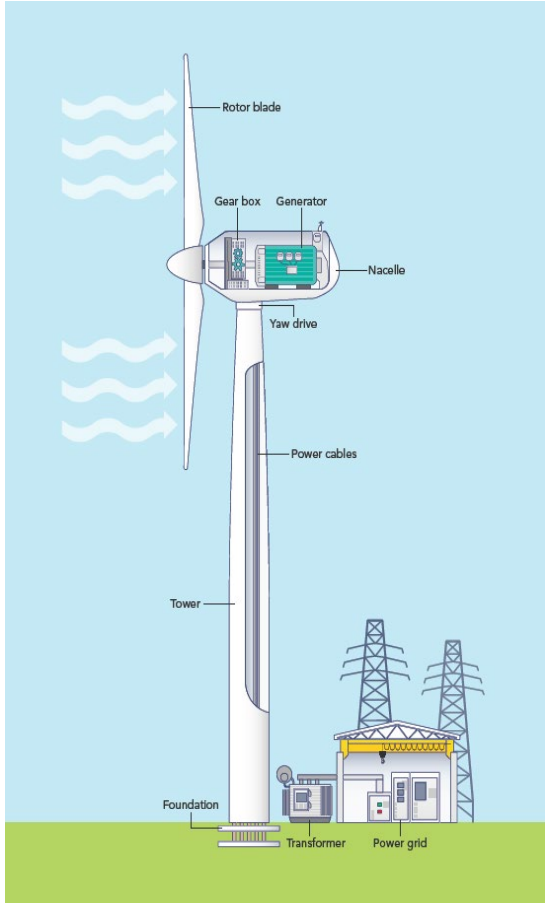
The risk reduction from extra measures did not justify the expense, proving the value of data-driven decision-making.

By using our consultancy expertise alongside the proven SALVO process and sophisticated DST software, the client gained:

- a clear business case for each option
- quantified risk exposure and payback periods
- confidence to prioritize investments that deliver real value.

This project is a benchmark for spare parts optimization and spares inventory management in the renewable energy sector. It exemplifies how data-driven analysis and asset optimization principles can deliver substantial value for renewable energy operators. By combining our consultancy expertise with advanced decision support tools, we empower clients to make confident, cost-effective investment decisions that enhance reliability and performance.

Our consultancy and DST software support structured, risk-based investment decisions and improved asset performance management. **Contact us** to find out how we can help.



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